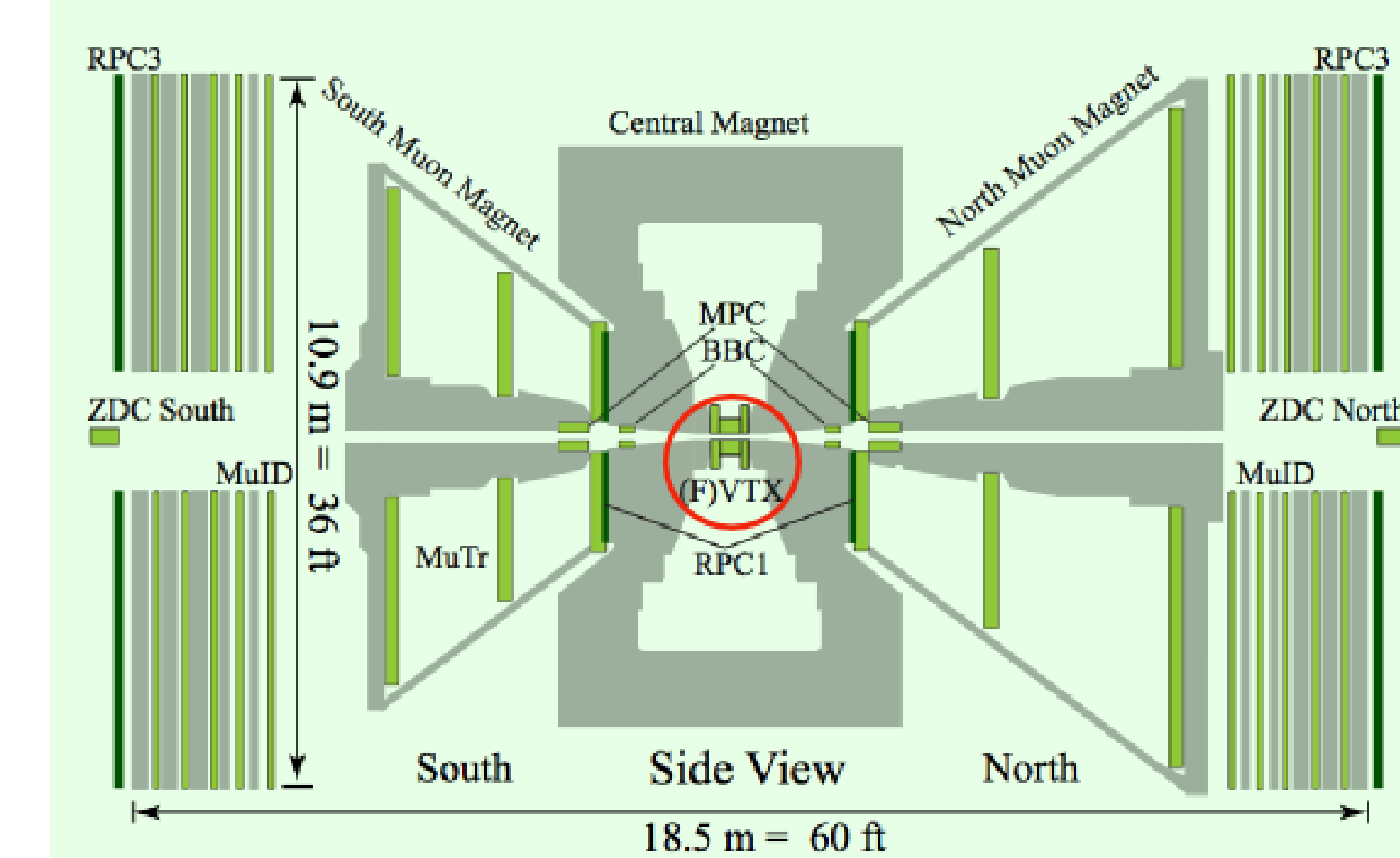
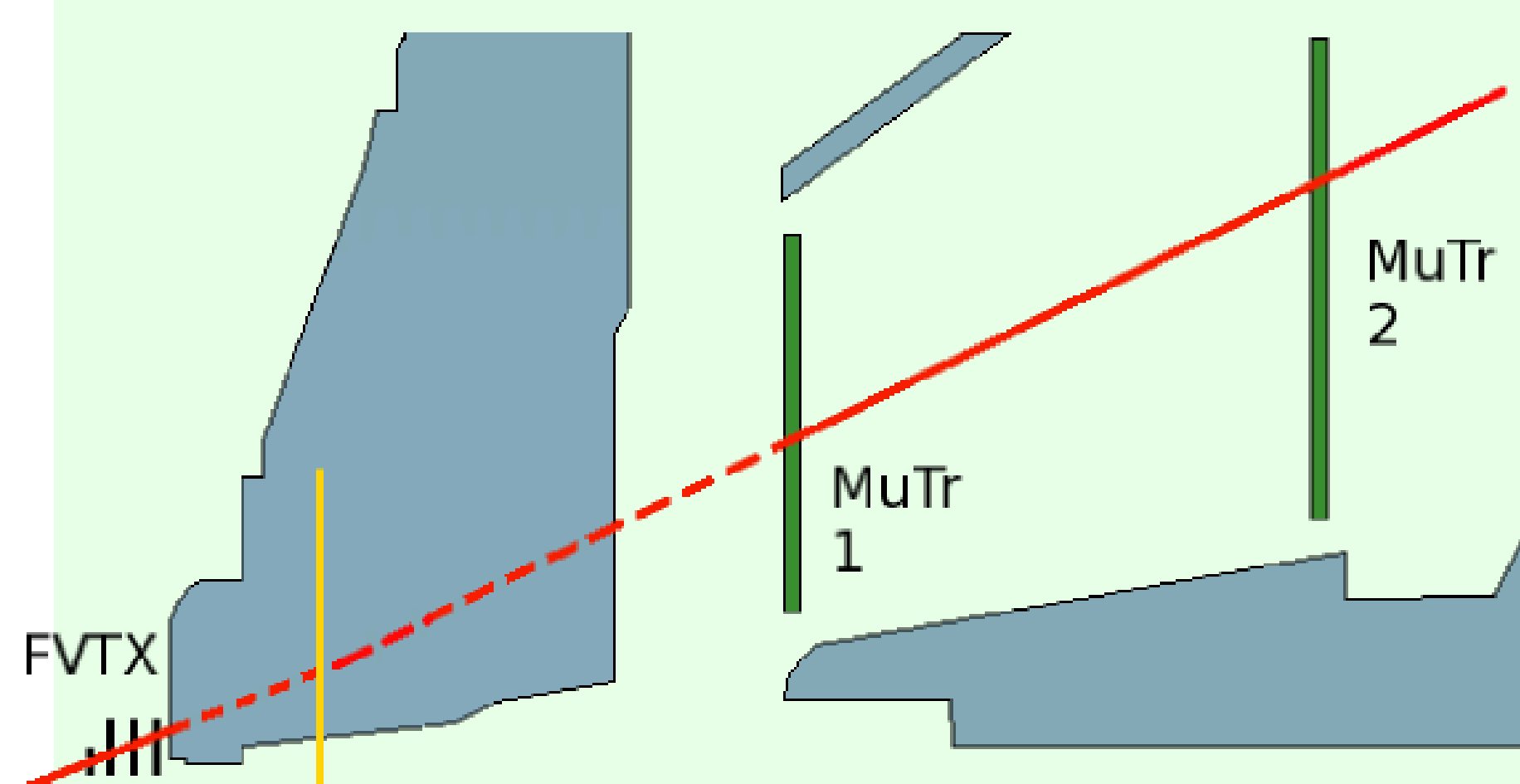
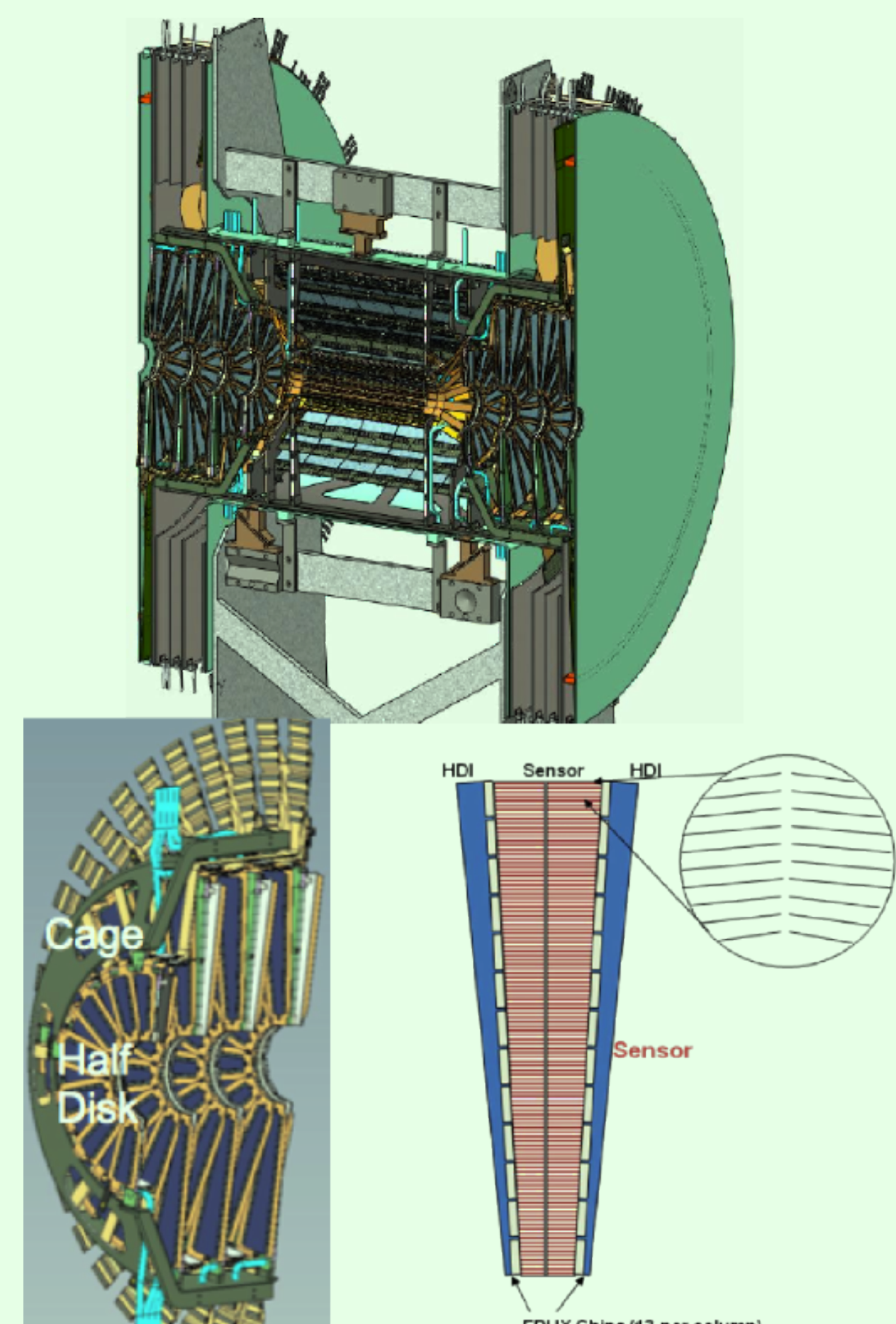
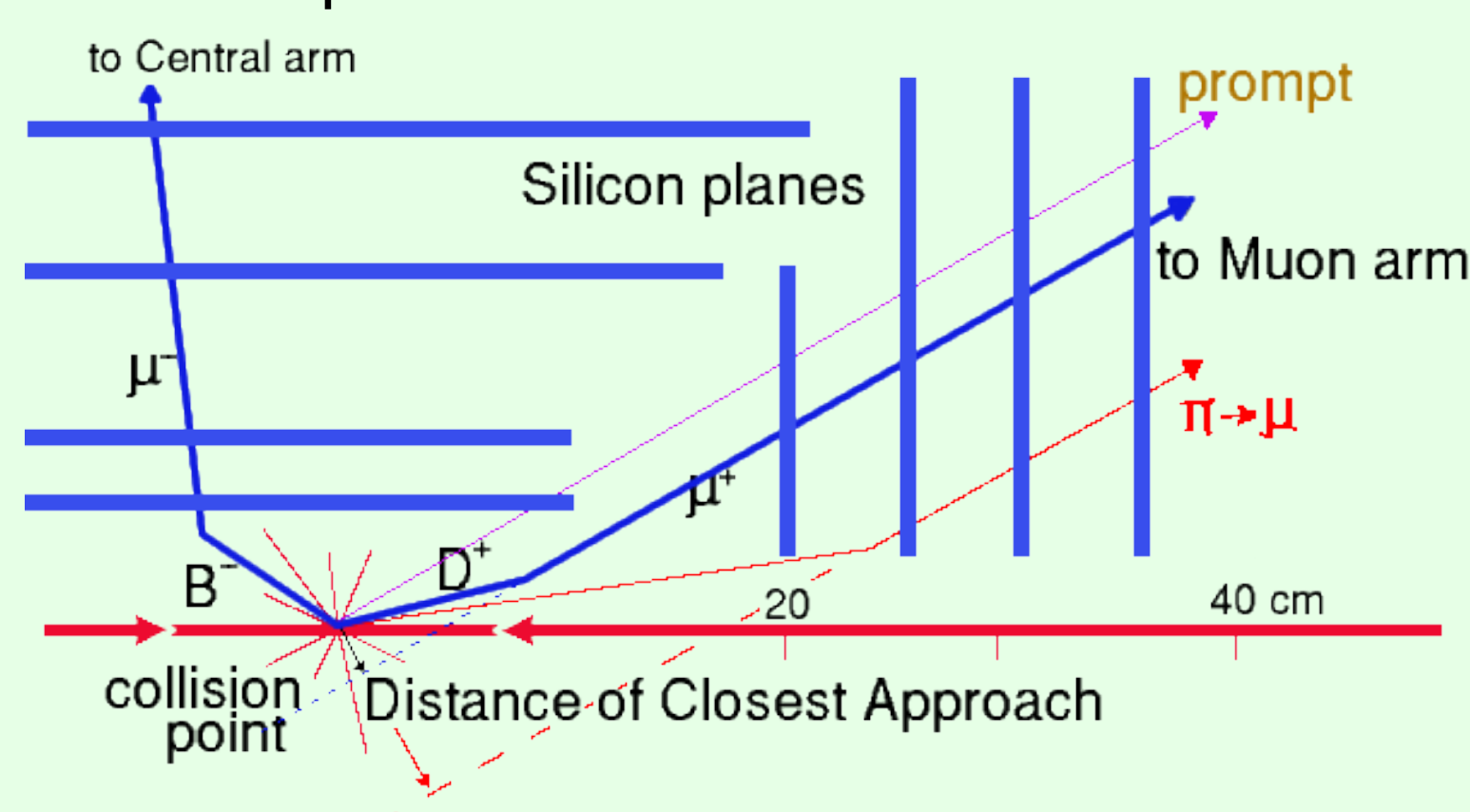


## Forward Vertex Detector



- full azimuthal coverage,  $1.2 < |\eta| < 2.4$
- 4 stations in each arm placed between collision point and hadron absorbers (no magnetic field)
- 96  $\phi$  columns of strips with  $\Delta r$  segmentation of  $75 \mu\text{m}$
- more details in Matt Durham's poster



- measure precise distance of the closest approach projected onto  $\mu p_T$  ( $DCA_R$ )
- discrimination btw.
  - $\pi/K \rightarrow \mu$
  - $D/B \rightarrow \mu$
- prompt muon identification for
  - quarkonia
  - $W \rightarrow \mu + \nu$
  - Drell-Yan
- high segmentation allows also determination of
  - centrality
  - reaction plane

## Data acquired in 2012 engineering Run and physics tasks

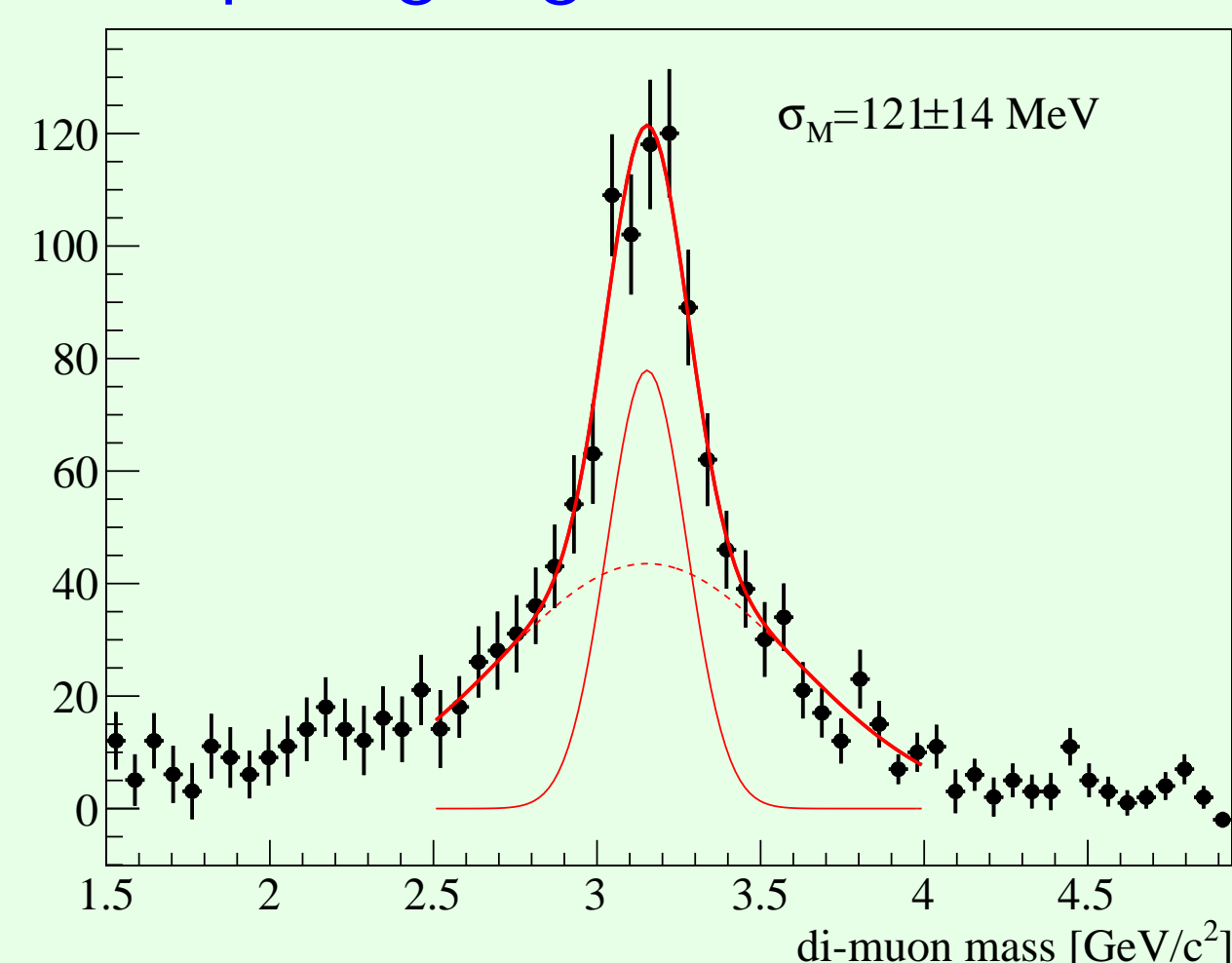
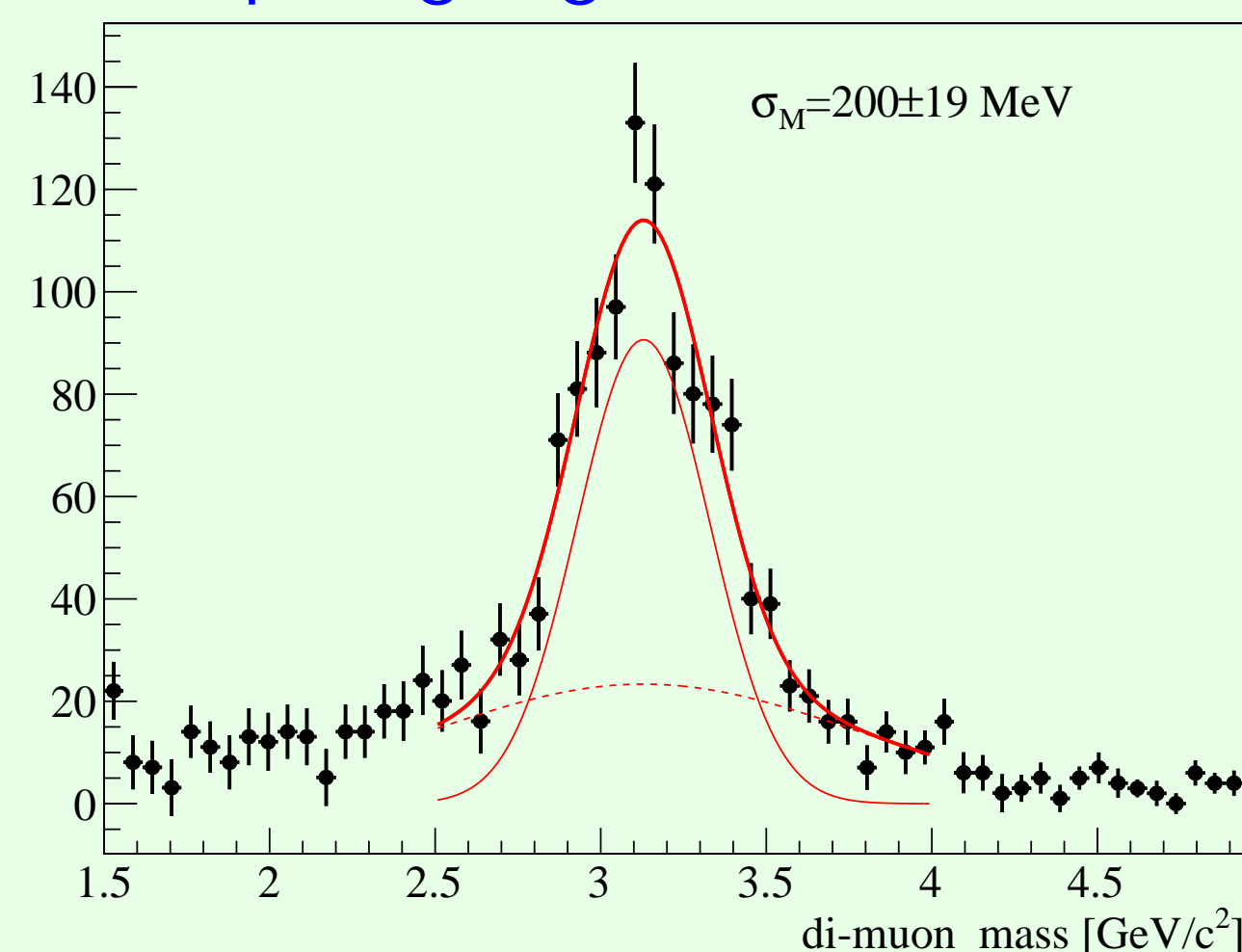
- **510 GeV  $p+p$  events:** 3.3 billion events
  - alignment studies
  - remove hadronic background in  $W$  analysis
  - heavy flavor, quarkonia and Drell-Yan
- **200 GeV  $U+U$ :** few million events
  - high occupancy studies
  - centrality, reaction plane determination
- **200 GeV  $\text{Cu}+\text{Au}$ :** 9 billion events
  - heavy flavor, quarkonia and Drell-Yan  $R_{CP}$  in Cu-going and Au-going direction
  - azimuthal anisotropy using FVTX reaction plane determination
- **cosmic data and field-off run**
  - high level alignment studies

## Improvement in di-muon mass resolution

- di-muon mass distribution in  $J/\psi$  region from 510 GeV  $p+p$  in north arm ( $1.2 < y < 2.2$ ) data sample

### opening angle from MuTr

### opening angle from FVTX

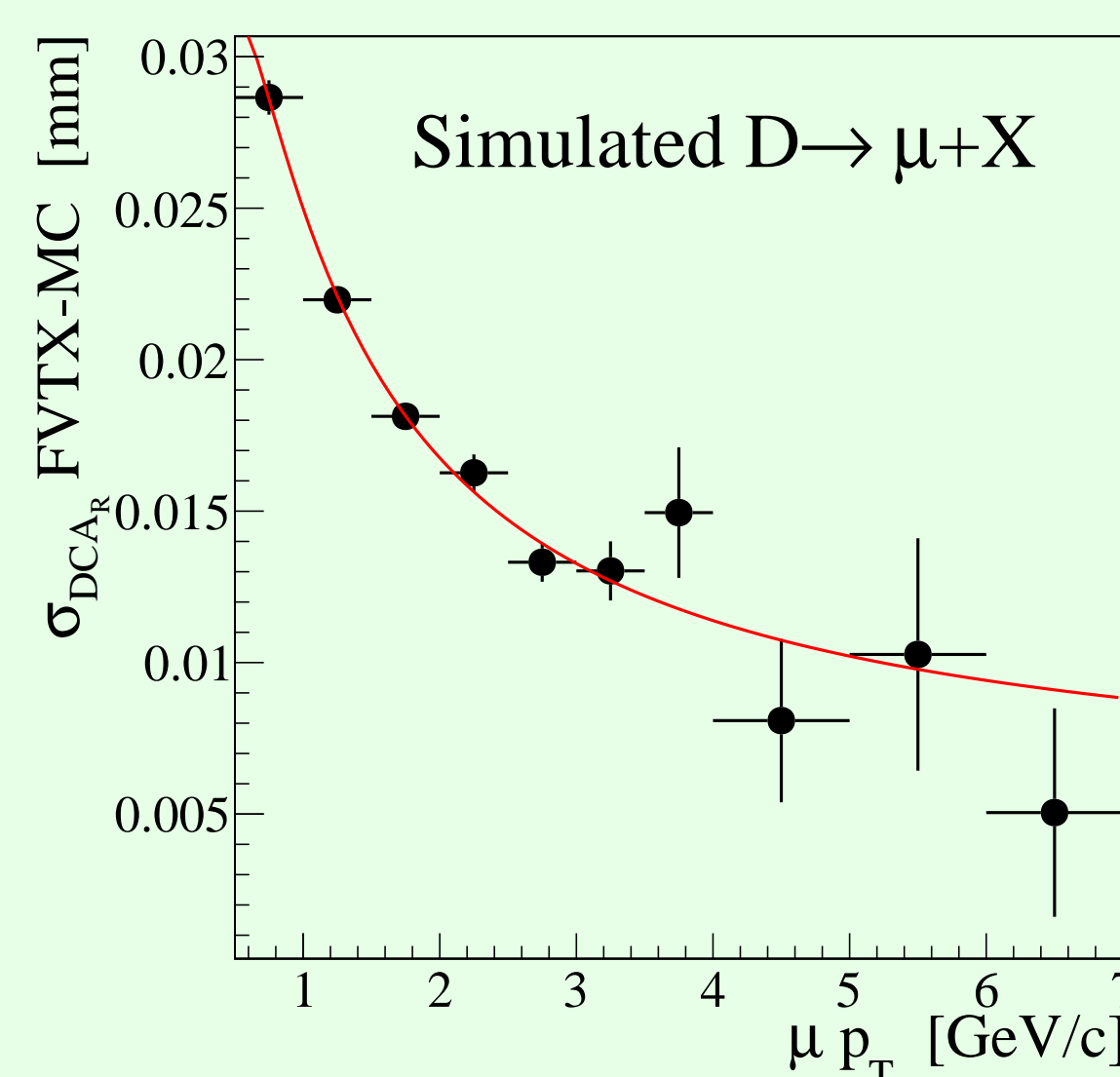
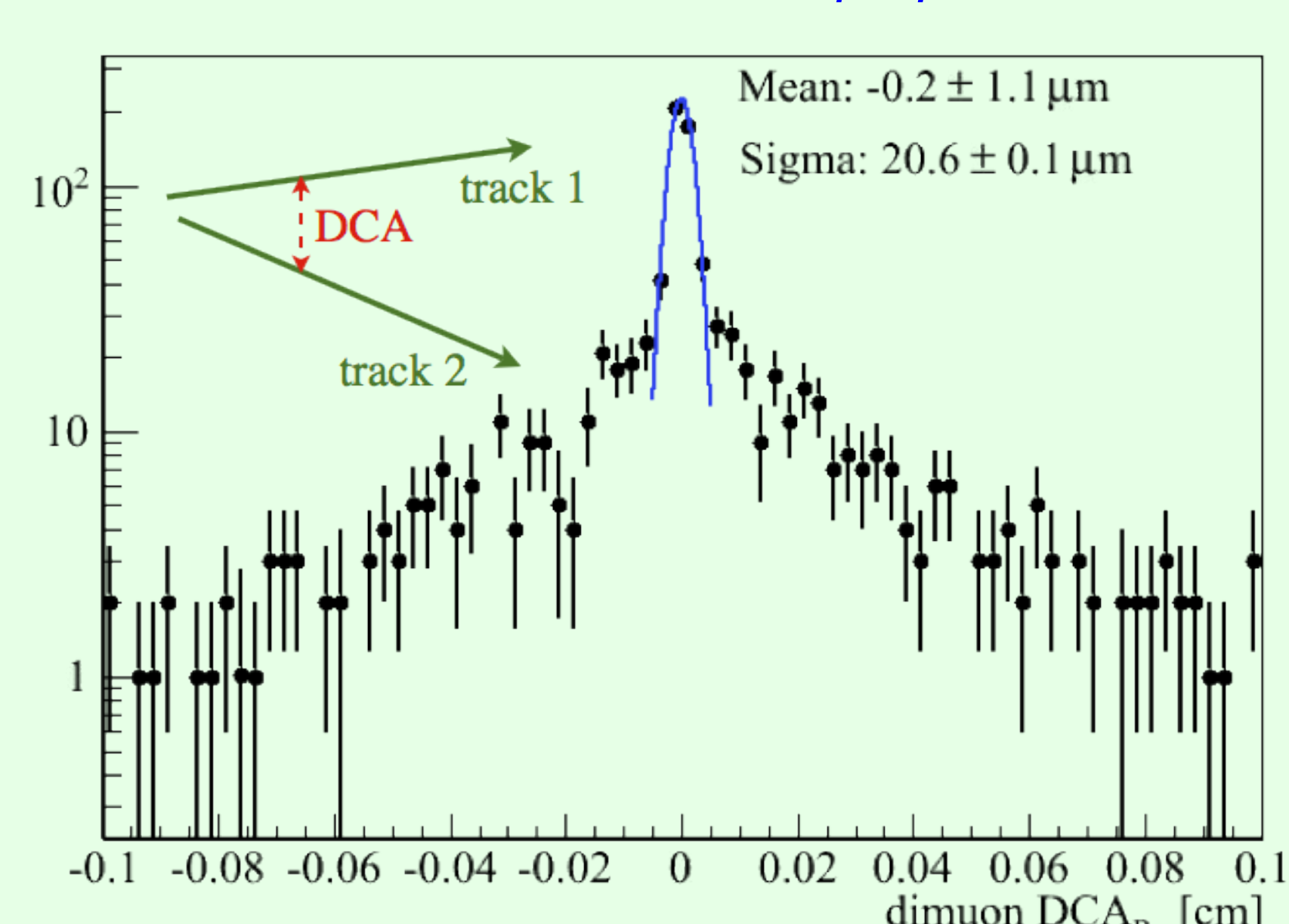


- di-muon opening angle measured by FVTX is not affected by multiple scattering in hadron absorber

## Measuring $DCA_R$ resolution with $J/\psi$ di-muon decays

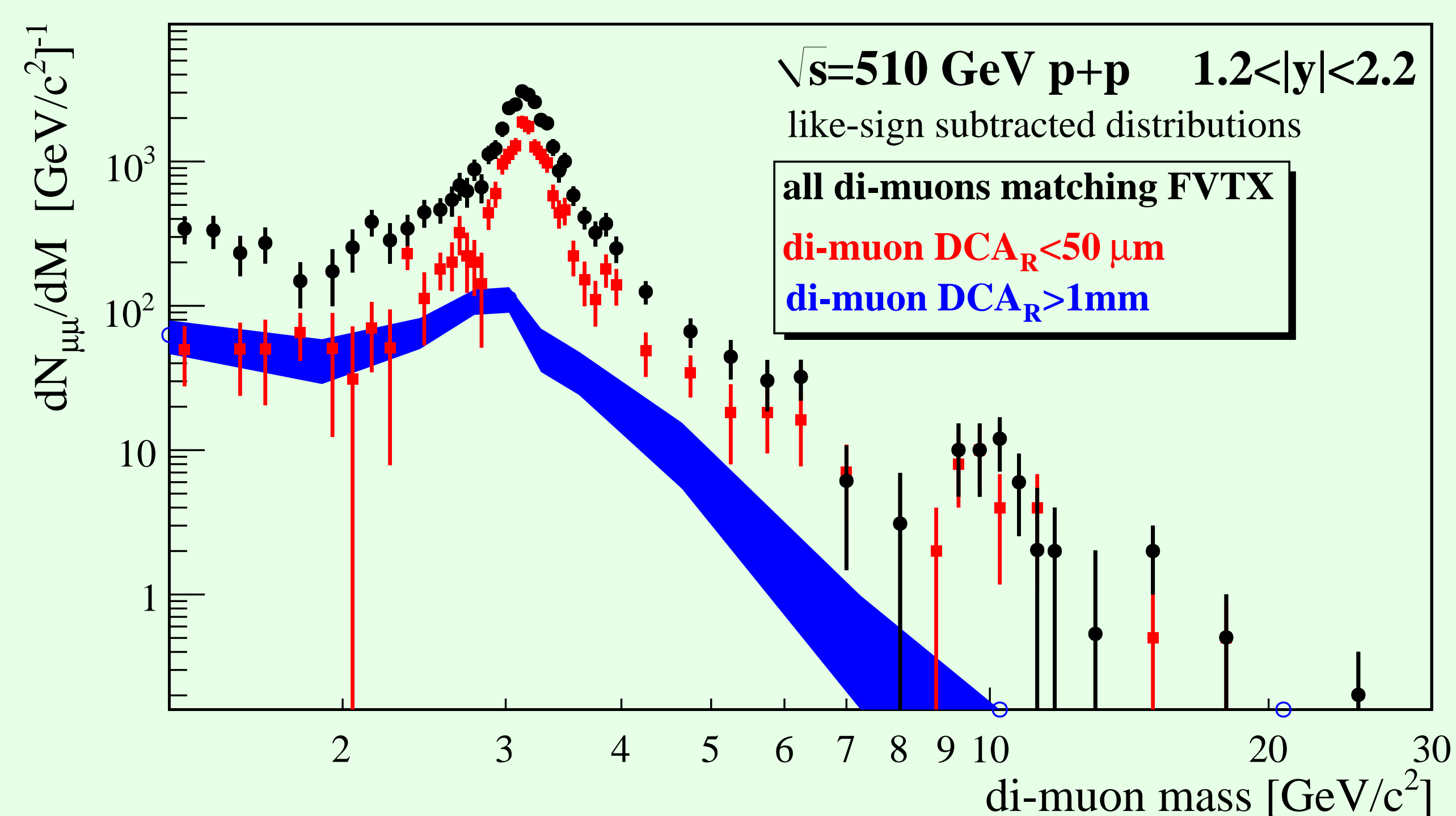
all di-muon decays from  $J/\psi$  should have  $DCA = 0 \pm$  detector resolution

### Real data 510GeV $p+p$



$DCA_R$  resolution of  $\sim 21 \mu\text{m}$  in agreement with simulation

## Selecting di-muon sources with dimuon $DCA_R$ measurement

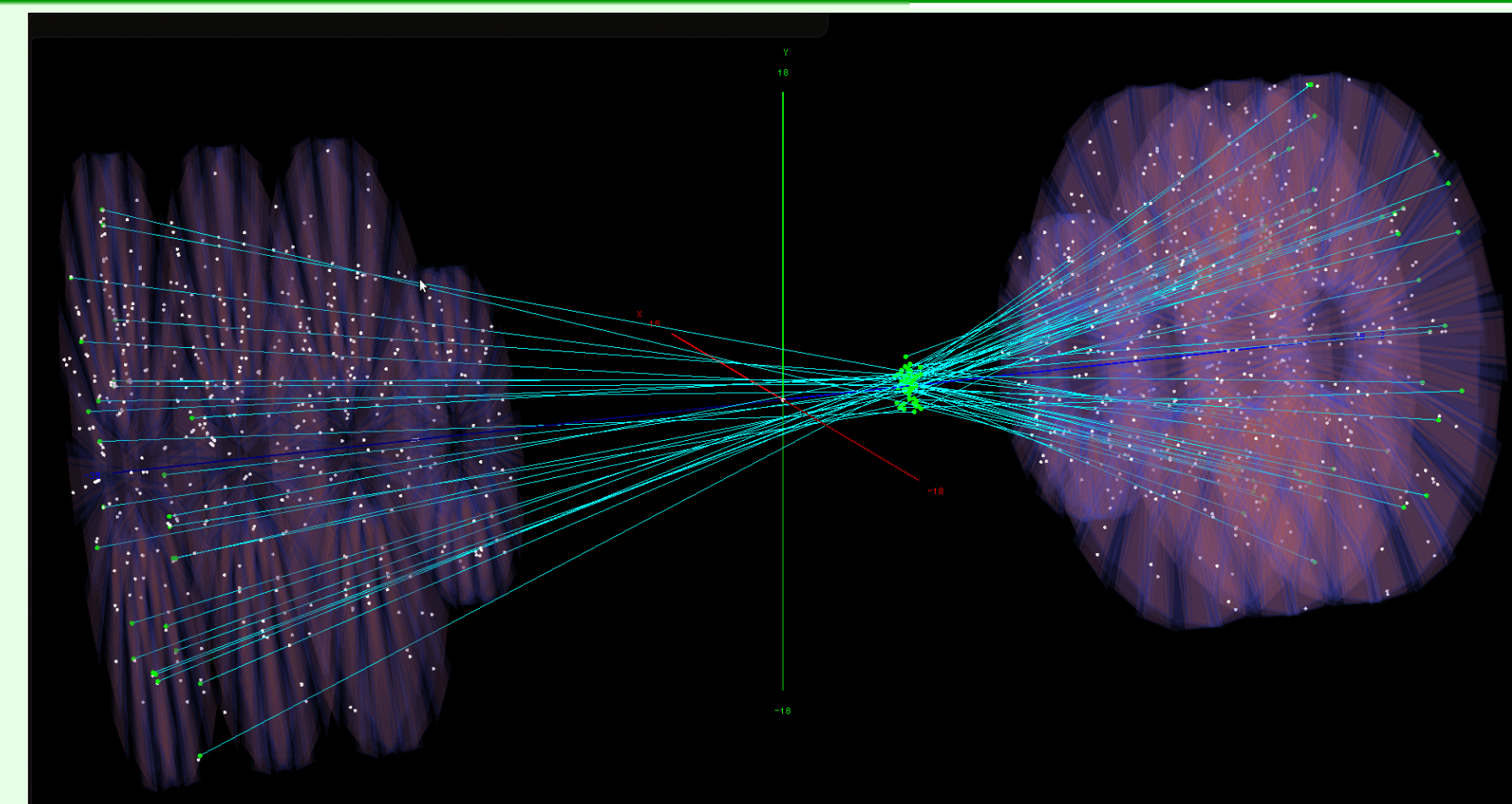


- $DCA_R < 50 \mu\text{m}$  : muon pair come from same vertex (resonances, Drell-Yan)
- $DCA_R > 1 \text{ mm}$  : dominated by correlated muon pairs with two vertices ( $c\bar{c}$ ,  $b\bar{b}$ , jets)

## Primary Vertex Determination

### $U+U$ event

- primary vertex defined as the point where more tracks share the same crossing (withing DCA resolution)
- method under development



## Strategy to count $D$ and $B$ meson decays from single $\mu$ $DCA_R$ distribution

### Components to be fit to total $DCA_R$ distribution

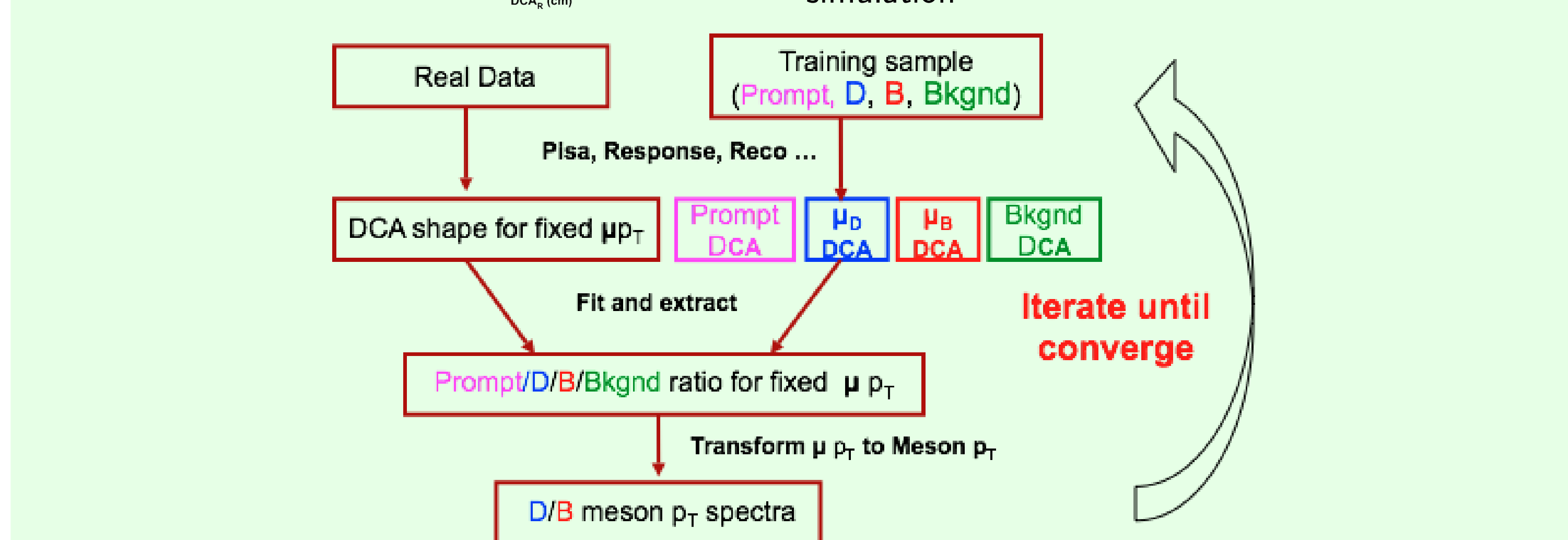
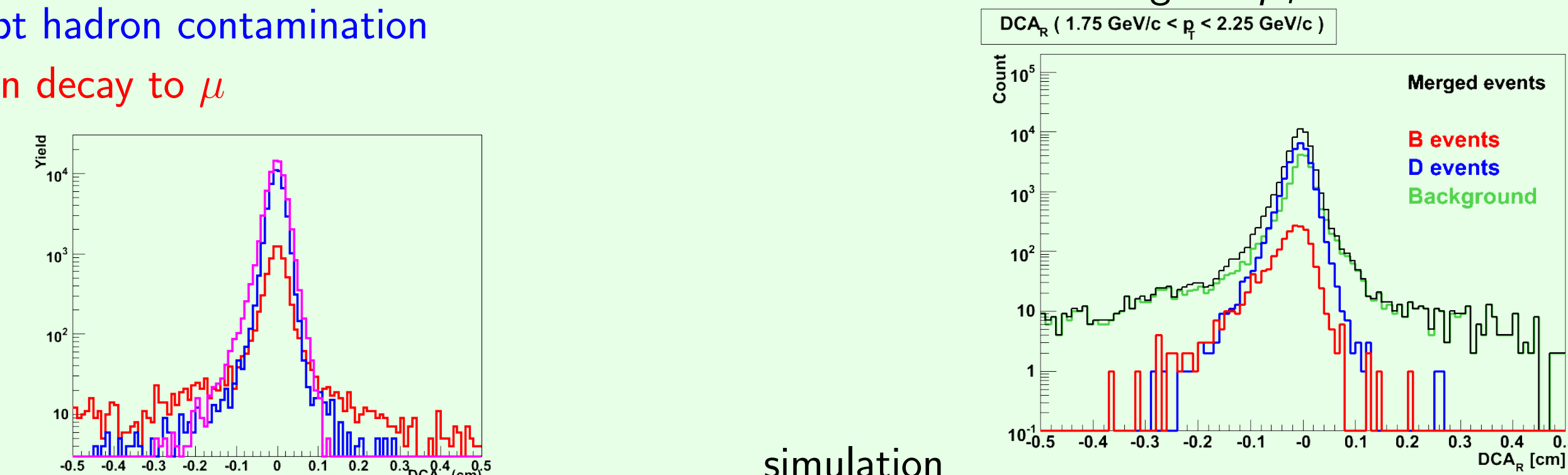
$J/\psi$  decays: prompt  $\mu + B \rightarrow J/\psi \rightarrow \mu$

Background = hadrons

hadrons identified in MuID:

- prompt hadron contamination
- hadron decay to  $\mu$

$D$  and  $B$  from a first guess  $p_T$  distribution in



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